

REMARKS

Claim Objections

1. The Examiner objected to claims 18 and 46 for grammatical reasons. The suggestions made by the Examiner have been followed.

Claim Rejections – 35 USC § 112

2.&3. The Examiner rejected claims 35-43, 45 and 46 as indefinite. Various amendments have been made to the claims to overcome this rejection. In general, amendments have been made to link various features to the structures being claimed. It is believed that these amendments will be clearly apparent and self-evident, therefore not requiring exhaustive comment.

Claim Rejections – 35 USC § 103

4.-7. The Examiner rejected claims 1-6, 8-13, 15-23, 25-43, 45 and 46 as unpatentable over Thorburn et al. in view of Kush. However, on page 8 of the official action at lines 4 to 6, the Examiner suggested that claims 1 and 35 should be amended to more distinctly define the bevels over the Thorburn et al. reference. This suggestion has been followed and these claims have been amended to make it clear that the bevels slope rearwardly of the nozzle in a direction towards the outer edges of the nozzle. Thorburn et al. do not disclose a bevel of this kind. There is a dishing at the center of the supporting face (see, for example, Fig. 3 of Thorburn et al.) and there is a bevel at the rear surfaces of the nozzle adjacent to the edges (see for example Fig. 2), but the rear surfaces do not form the "support surface" defined in the present invention since they do not face the reverse surface of the belt and anyway do not affect the performance of the nozzles.

The bevel as defined in claims 1 and 35 is designed to create an increasing geometric gap in the direction of coolant flow, which thereby causes a localized hydro-dynamic effect that is particularly advantageous (as described in the specification of the present application). The dishing illustrated in Thorburn et al. would create a decreasing geometric gap towards the edges of the nozzle and would not have the desired effect.

For this reason, it is believed that claims 1 and 35, as amended, and the claims dependent on these independent claims, should now be considered allowable over the prior art. Nevertheless, the reason why the teachings of Thorburn et al. and Kush cannot be properly combined to form the basis of an obviousness rejection is discussed again below for consideration with respect to these claims and the other rejected claims.

Kush characterizes the invention therein disclosed as "an improvement over the method and apparatus described in" prior application Serial No. 07/902,997, "and is directed to a method and apparatus ... in which the cooling or quenching fluid is contained" (col. 3, lines 22-27).

U.S. patent No. 6,102,102 (Harrington) issued on a second continuation of Serial No. 07/902,997, both predecessor applications having been abandoned. In that patent, it is stated that "the cooling means 32 and 34 can be conventional cooling means such as fluid cooling nozzles positioned to spray a cooling fluid directly on the inside and/or outside of belts 10 and 12 ..." (col. 4, lines 33-37). No further details are set forth regarding the cooling means.

Kush, as quoted above, expressly leads an artisan of ordinary skill to consider Kush and Harrington together. So considered, Kush is an improvement providing containment for direct-spray cooling means, which is consistent with the language of Kush (in particular, "impinges on the surface of the belt," col. 4, line 68 - col. 5, line 1, and "continuous containment fluid curtain stream," col. 5, lines 52 to 64.

The Examiner, in the Office Action (page 8, last five lines), dismisses the "continuous film" argument as "merely a condition/functionality imposed on the coolant itself ... not a structural feature." In other words, if some portions of the Kush device (slot and vacuum system) were incorporated in the cooling/support arrangement of Thorburn et al., they might be operable to provide a continuous film of uniform thickness. But this does not establish that it would be obvious to make such a piecemeal reconstruction of Kush and Thorburn et al. in the first place, given that the disclosed advantage of Kush is designed for fluid conditions different from those required at the reverse surface of belts in the Thorburn et al. mold region, and necessarily includes "curtain streams" which could not be provided in the mold region.

It should also be pointed out that the rapidly flowing coolant plus the applied vacuum in combination with the tension in the belts maintains the belts in a dynamic position with respect to the underlying support structure. This is referred to as belt "stand-off" (see Figure 7 of the present application). This results in a geometric gap through which the coolant flows. The better the control of the stand-off, the more uniform the coolant flow. The stand-off curves of Fig. 7 show, for example, that in the particularly preferred embodiment of the present invention, the geometric gap is relatively constant as the load (a combination of the belt tension and the net pressure of coolant on the belt) varies.

The nozzles of Thorburn et al. in combination with a vacuum system and belt tension achieve this balance acceptably, but at the cost of non-uniformity in cooling caused by the two-dimensional layout of the nozzles.

The Kush reference does not offer any suggestion that a linear nozzle would be useful in achieving the sort of balance of forces required to maintain a stable stand-off required in the apparatus of Thorburn et al. There is a difference between flows in a hexagonal nozzle system and the linear system of Kush, and the dynamic balance needed to achieve suitable stand-off would be very different, making the linear system non-obvious. It would not be at all clear to a person skilled in the art that the linear slot of Kush would overcome the problem of Thorburn et al. while making it possible to maintain the stable stand-off of that type of cooling system.

For these reasons, it is believed that the subject matter of the claims is not obvious from Thorburn et al. and Kush.

The Examiner went on to reject the subject matter of claims 7 and 24 in view of Thorburn et al., Kush and Dumont-Fillen. Claims 7 and 24 relate to the provision of means to filter the coolant before it is passed through the slot. Since these claims are dependent claims, and

since the claims from which they depend are believed to be unobvious over Thorburn et al. and Kush for the reasons given above, it is believed that the subject matter of claims 7 and 24 is unobvious for the same reasons as the claims from which they depend.

Favorable reconsideration of this application is accordingly courteously requested.

Respectfully,

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